FCC/IC - TEST REPORT

Report Number	: 68.950.18.0240.01	Date of Issue:	June 15, 2018
Model	: GO360		
Product Type	: GUARDZILLA 360 ALL-IN-ONE HD OUTDOOR VIDEO CAMERA		
Applicant	: Practecol, LLC		
Address	: 3155 Sutton Blvd, Suite 202 St. Louis, MO 63143, USA		
Production Facility	: SKY LIGHT Electronic (ShenZhen) Limited		
Address	: No. 1, 5 and 6 Building, JinBi Industrial Area, HuangTian, BaoAn, Shenzhen, China		
Test Result	: n Positive o Negative		
Total pages including Appendices	: 32		

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District Shenzhen 518052 P.R. China
Telephone:	86 755 8828 6998
Fax:	86 755 828 5299
FCC Registration No.:	514049
IC Registration No.:	10320A

3 Description of the Equipment Under Test

Product:	GUARDZILLA 360 ALL-IN-ONE HD OUTDOOR VIDEO CAMERA
Model no.:	GO360
FCC ID:	2AND3-GO360
IC:	23183-GO360
Options and accessories:	Adapter and USB Cable
Rating:	3.6Vdc 5200mAh Li-ion Rechargeable battery charged by an external adapter
Adapter information:	Adapter Model: ASSA65a-053200 Adapter Input: 100-240Vac, 50/60Hz; 0.45A Adapter Output: 5.3Vdc, 2.0A
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integrated antenna
Antenna Gain:	1.3dBi
Description of the EUT:	The Equipment Under Test (EUT) is a wireless camera which support WiFi and Bluetooth function operated at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5 April 2018	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 DTS Measurement Guidance v04 DTS Measurement Guidance and ANSI C63.10 (2013).

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C/ RSS-247 Issue 2/RSS-Gen Issue 5						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207 & RSS-GEN 8.8	Conducted emission AC power port	10	Site 1	☒	☐	☐
§15.247 (b) (1) & RSS-247 5.4(d)	Conducted peak output power	13	Site 1	☒	☐	☐
§15.247(a)(1) & RSS-247 5.1(b)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1) & RSS-247 5.1(b)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii) & RSS-247 5.1(d)	Dwell Time	---	---	☐	☐	☒
§15.247(e) & RSS-247 5.2(b)	Power spectral density	14	Site 1	☒	☐	☐
§15.247(a)(2) & RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth and 99% Occupied Bandwidth	15	Site 1	☒	☐	☐
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	19	Site 1	☒	☐	☐
§15.247(d) & RSS-247 5.5	Band edge	25	Site 1	☒	☐	☐
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	27	Site 1	☒	☐	☐
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1		☒	☐	☐

Note 1: N/A=Not Applicable.
Note 2: The EUT uses an Integrated antenna, which gain is 1.3dBi. In accordance to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AND3-GO360, IC: 23183-GO360, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: June 7, 2018

Testing Start Date: June 7, 2018

Testing End Date: June 14, 2018

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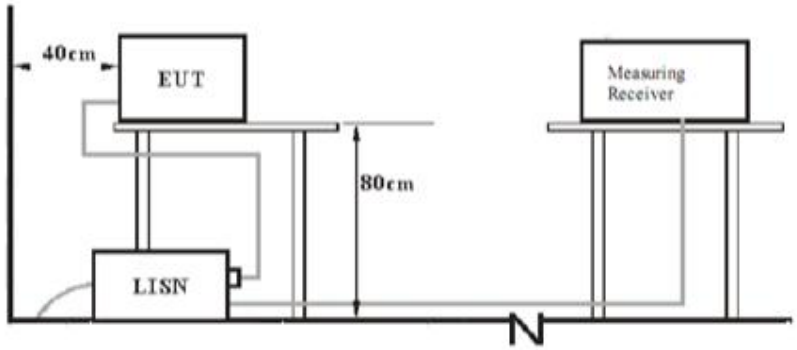
Reviewed by:	Prepared by:	Tested by:
John Zhi	Alan Xiong	Tree Zhan
Section Manager	Project Engineer	Test Engineer

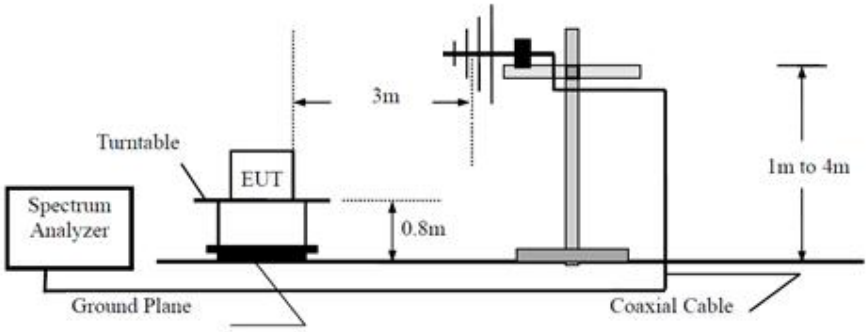
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

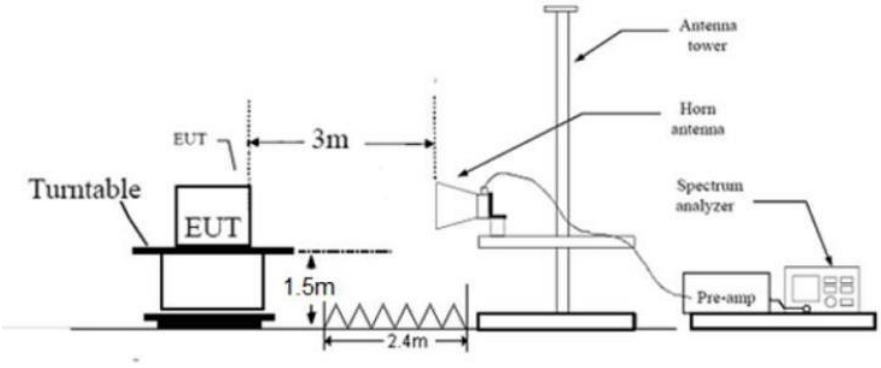


7.2 Radiated test setups

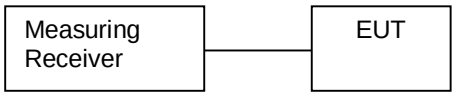
Below 1GHz



Above 1GHz



7.3 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
PC	Lenovo	X240	---

Test mode sample have been processed by manufacturer, the operation steps are as follows:

1) Connect to PC via USB Cable, and update the driver if possible

2) Open CRT software and enter the serial port

3) Enter the following cord in the CRT software:

root
modprobe ambad
amba_debug -g 84 -d 1
amba_debug -g 87 -d 1
amba_debug -g 34 -d 1
/usr/local/bin/brcmbt -d --patchram /lib/firmware/cypress/cyw43438/cyw43438.hcd /dev/ttyS1 --no2bytes --baudrate 1500000 --bd_addr 00:00:88:c0:ff:ee --use_baudrate_for_download
hcicmd 01 1E 20 03 00 25 00
hcicmd 01 1E 20 03 00 25 00 for 2402MH
hcicmd 01 1E 20 03 13 25 00 for 2440MHz
hcicmd 01 1E 20 03 27 25 00 for 2480MHz

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

n

*Decreasing linearly with logarithm of the frequency

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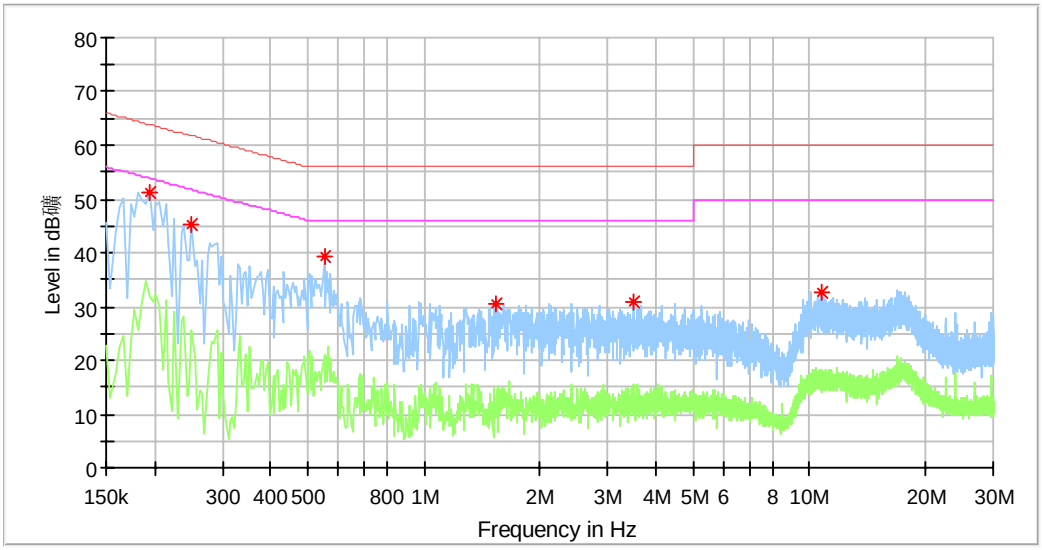
Conducted Emission

Product Type	:	GUARDZILLA 360 ALL-IN-ONE HD OUTDOOR VIDEO CAMERA
M/N	:	GO360
Operating Condition	:	Charging and normal working Mode
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.194000	51.38	---	63.86	12.48	L1	10.2
0.250000	45.32	---	61.76	16.44	L1	10.2
0.550000	39.21	---	56.00	16.79	L1	10.2
1.538000	30.64	---	56.00	25.36	L1	10.2
3.502000	30.84	---	56.00	25.16	L1	10.3
10.786000	32.73	---	60.00	27.27	L1	10.6

*Correct factor=cable loss + LISN factor

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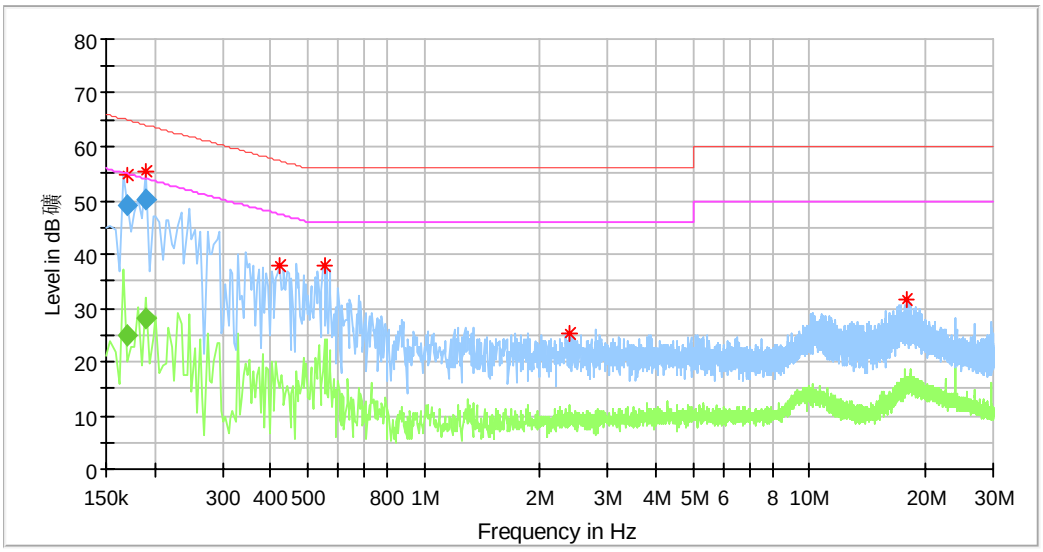
Conducted Emission

Product Type	:	GUARDZILLA 360 ALL-IN-ONE HD OUTDOOR VIDEO CAMERA
M/N	:	GO360
Operating Condition	:	Charging and normal working Mode
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.169500	---	24.96	54.98	30.02	N	10.3
0.169500	49.01	---	64.98	15.97	N	10.3
0.189500	---	28.02	54.06	26.04	N	10.3
0.189500	50.24	---	64.06	13.82	N	10.3
0.422000	37.99	---	57.41	19.42	N	10.3
0.550000	38.03	---	56.00	17.97	N	10.4
2.382000	25.37	---	56.00	30.63	N	10.4
17.858000	31.57	---	60.00	28.43	N	11.4

*Correct factor=cable loss + LISN factor

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9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(d), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Bottom channel 2402MHz	8.70	Pass
Middle channel 2440MHz	7.85	Pass
Top channel 2480MHz	7.78	Pass

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9.2 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]
≤8

Test result

Frequency MHz	Power spectral density dBm	Result
Top channel 2402MHz	-5.71	Pass
Middle channel 2440MHz	-6.62	Pass
Bottom channel 2480MHz	-6.71	Pass

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9.3 6 dB Bandwidth and 99% Occupied Bandwidth

Test Method for 6 dB Bandwidth

1. Use the following spectrum analyzer settings:
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Test Method for 99 % Bandwidth

1. Use the following spectrum analyzer settings:
RBW=1% to 5% of the actual occupied, VBW≥3RBW, Sweep = auto,
Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
≥500

Test result

Frequency MHz	6dB bandwidth kHz	99% bandwidth kHz	Result
Bottom channel 2402MHz	724	1059	Pass
Middle channel 2440MHz	724	1059	Pass
Top channel 2480MHz	720	1063	Pass

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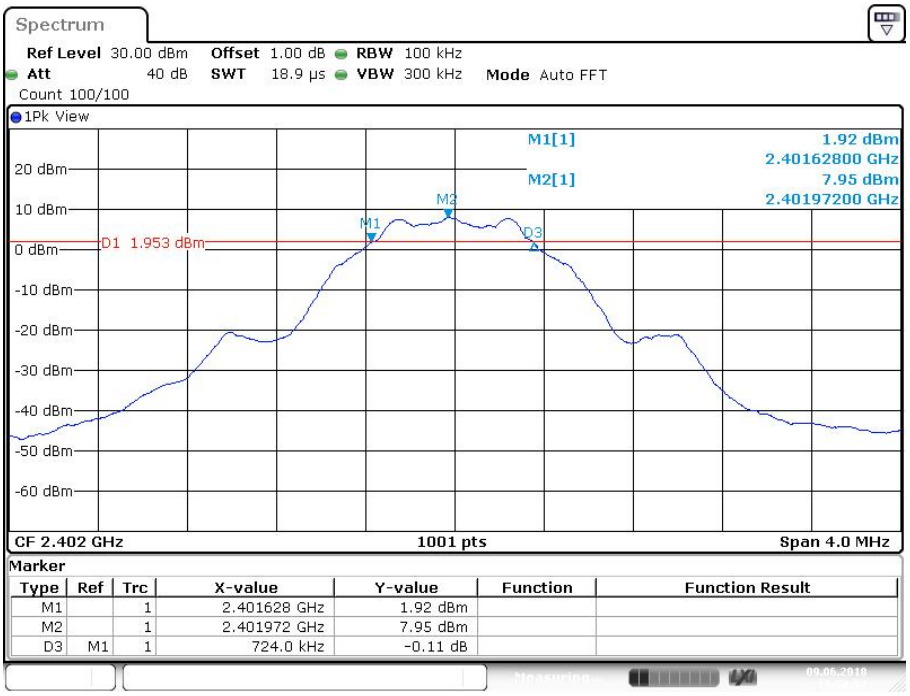
6 dB Bandwidth

Low channel 2402MHz



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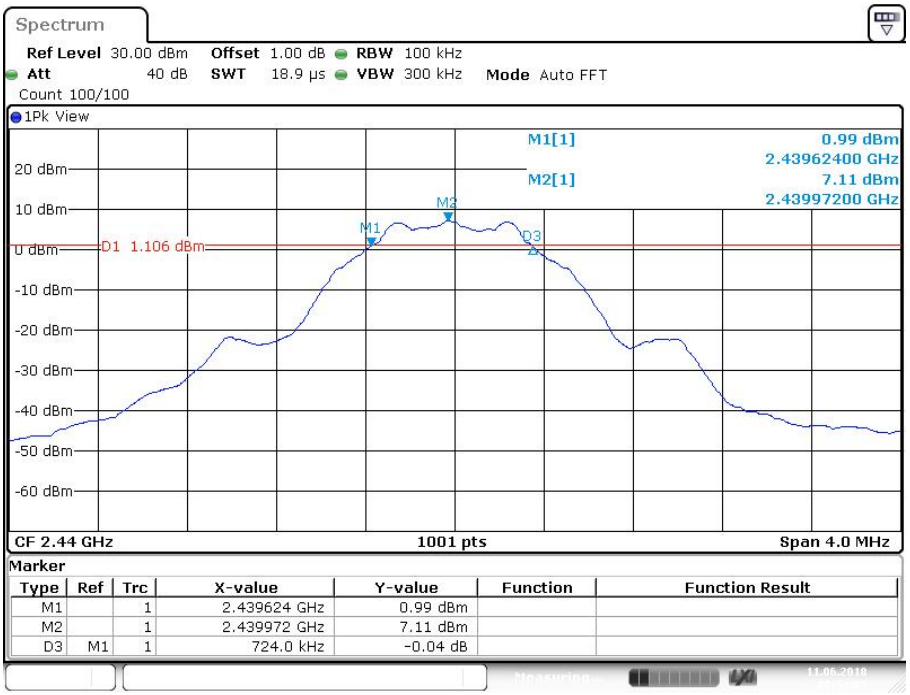
Middle channel 2440MHz



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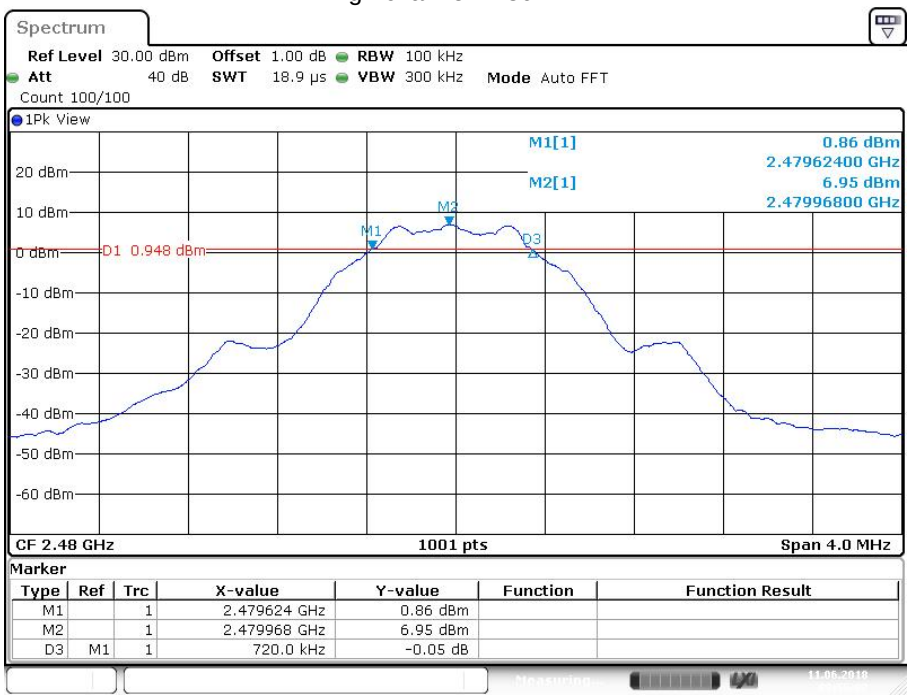
6 dB Bandwidth and 99% Bandwidth

High channel 2480MHz



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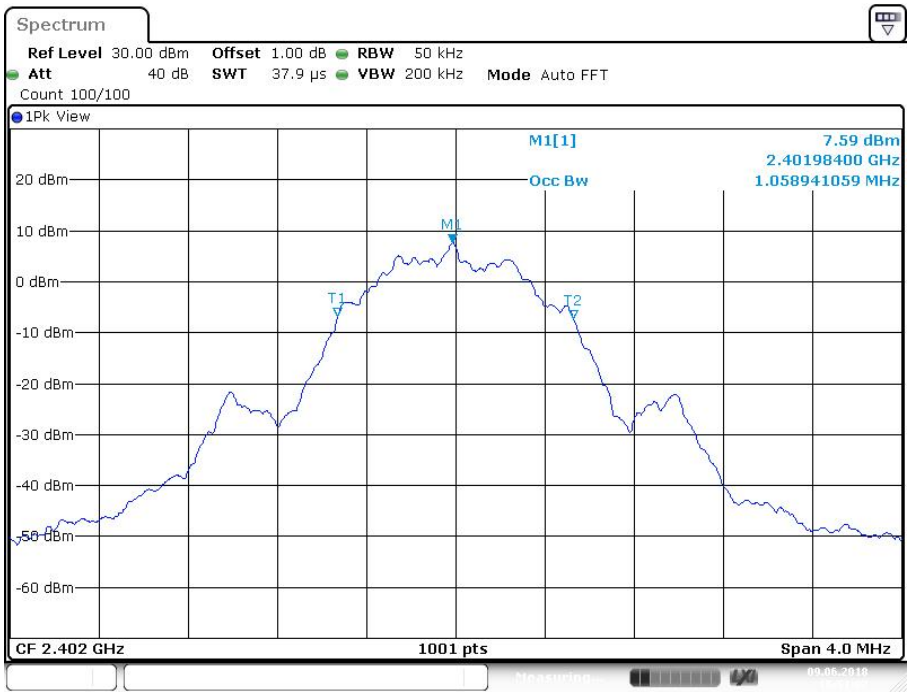
Low channel 2402MHz



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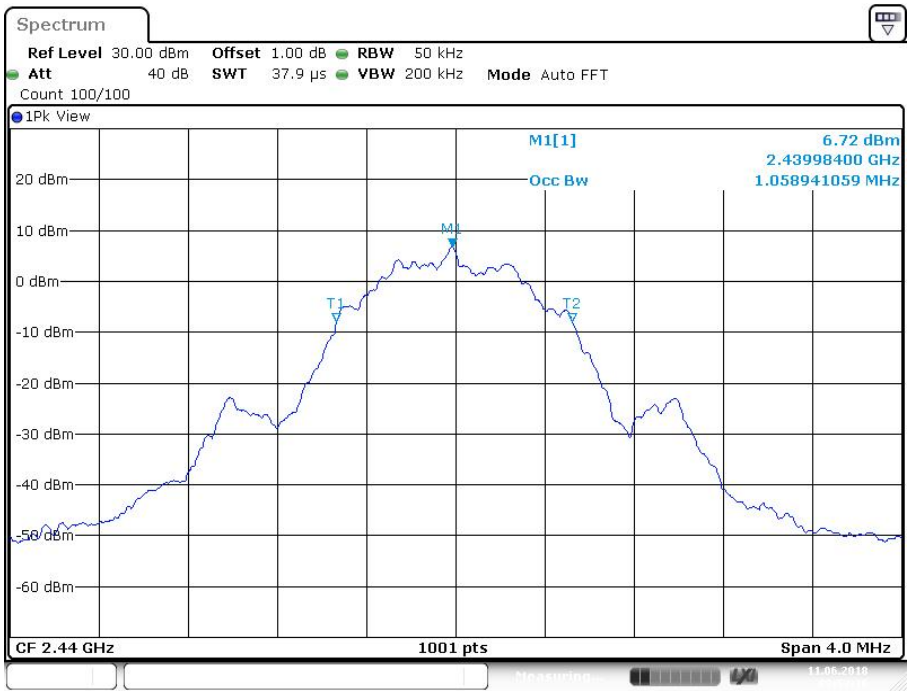
99% Bandwidth

Middle channel 2440MHz



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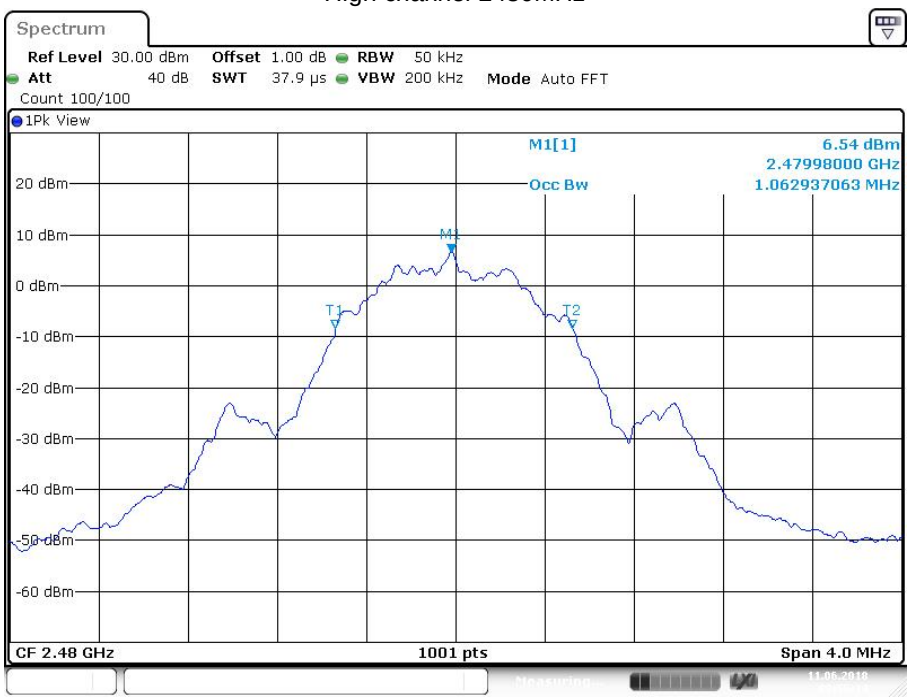
High channel 2480MHz



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9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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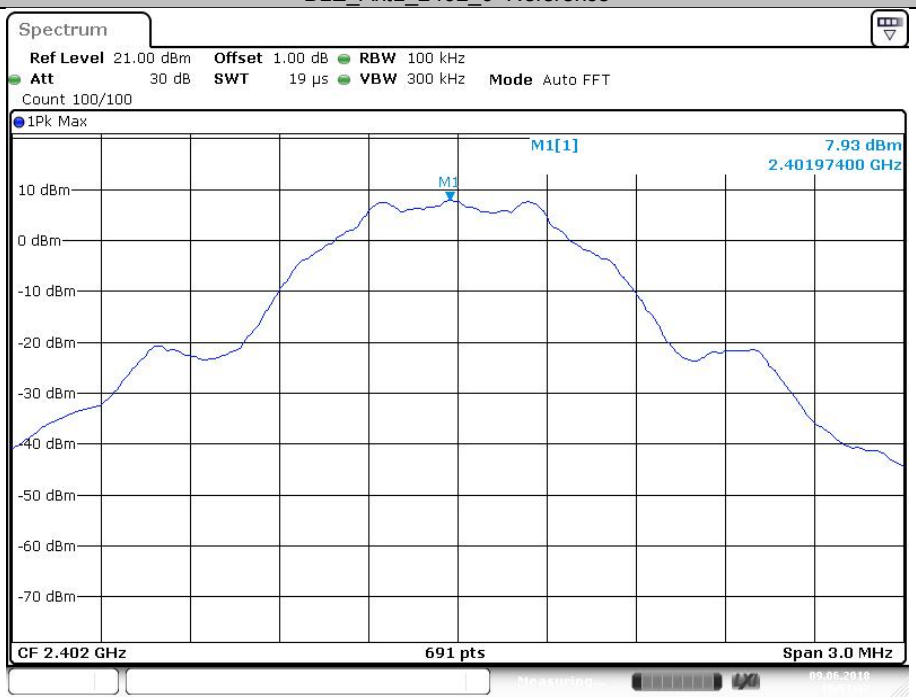
Spurious RF conducted emissions

BLE_Ant1_2402_0~Reference



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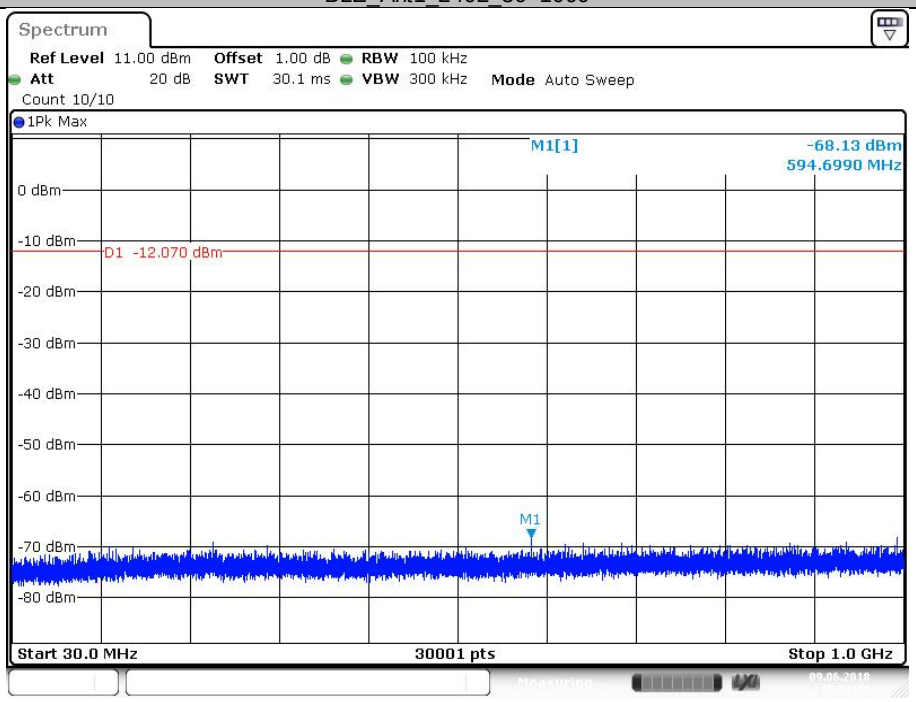
BLE_Ant1_2402_30~1000



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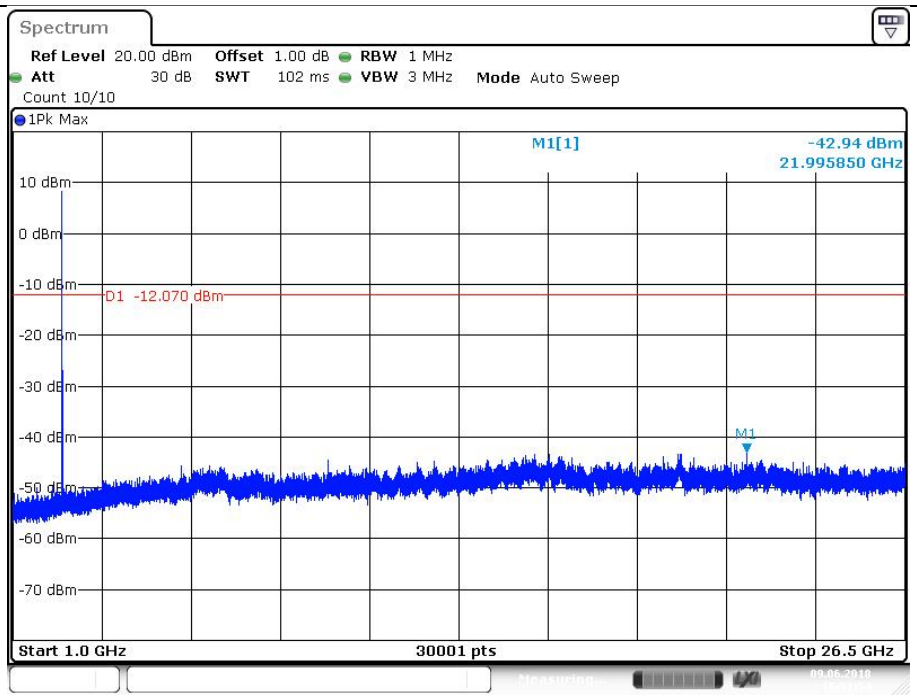
BLE_Ant1_2402_1000~26500



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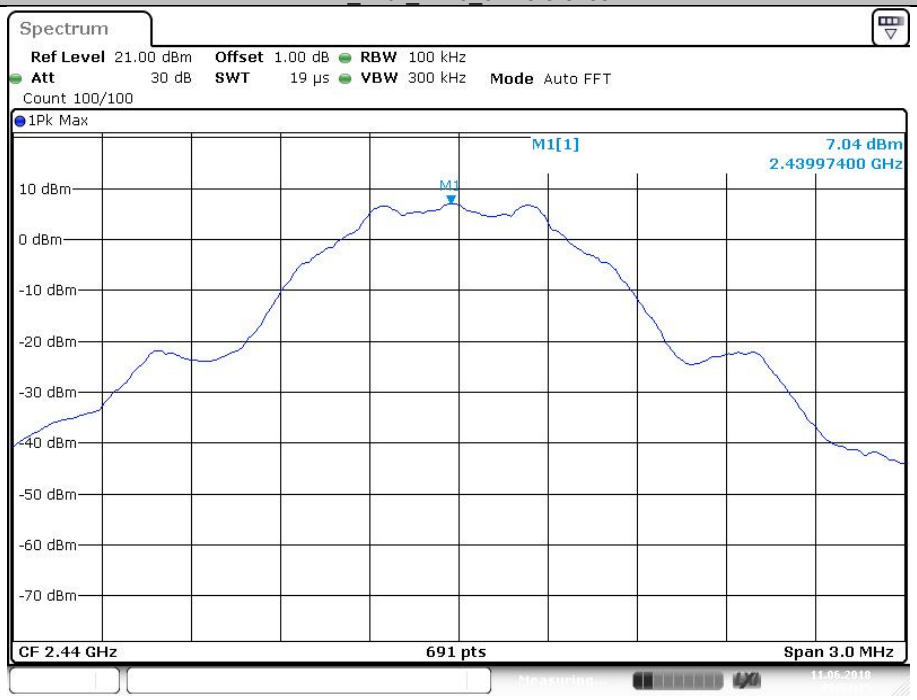
BLE_Ant1_2440_0~Reference



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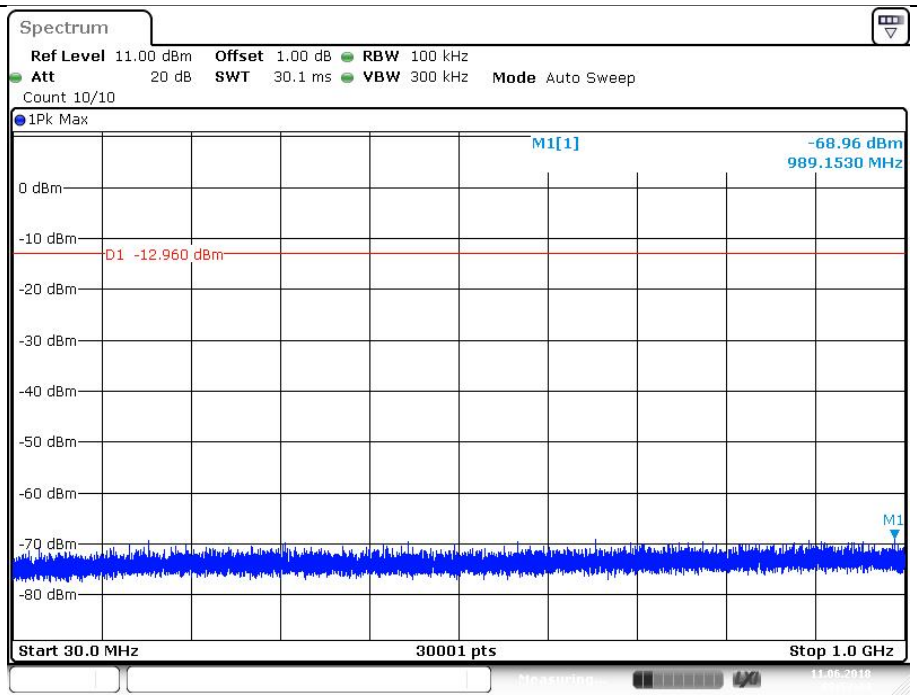
BLE_Ant1_2440_30~1000



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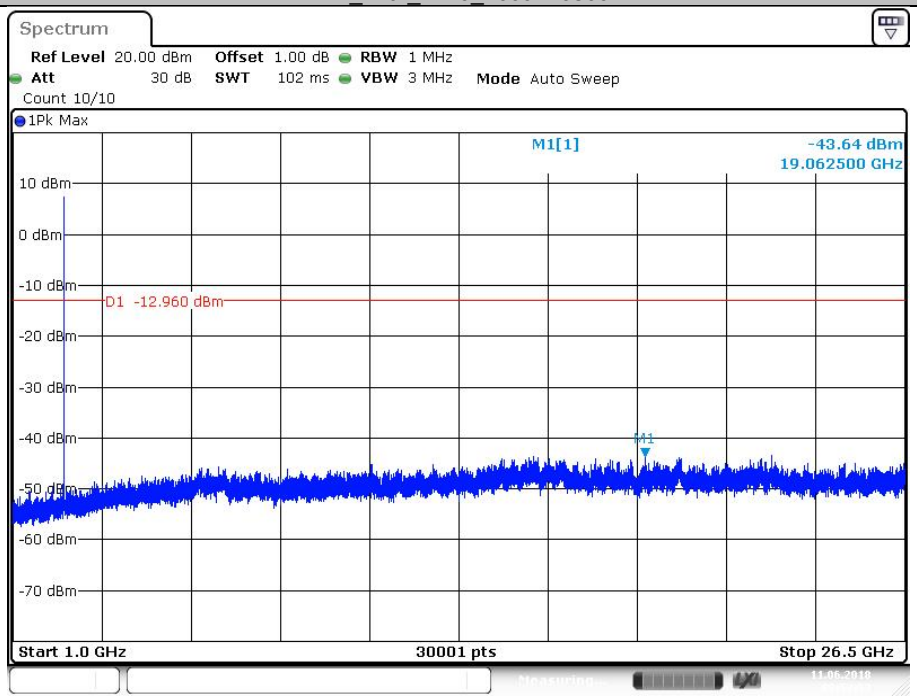
BLE_Ant1_2440_1000~26500



Date:11.JUN.2018 09:53:53

BLE_Ant1_2480_0~Reference

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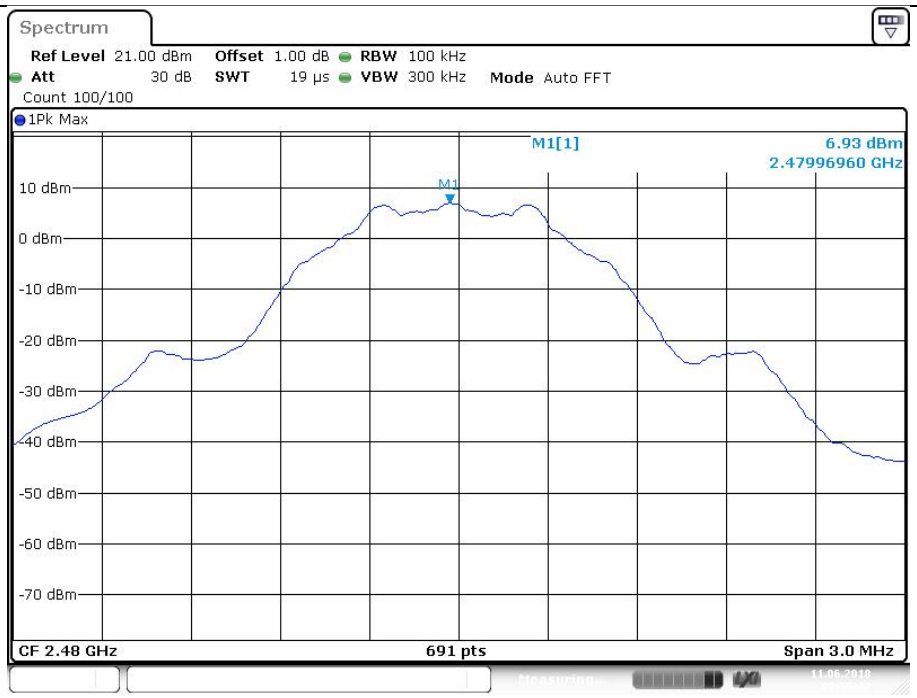
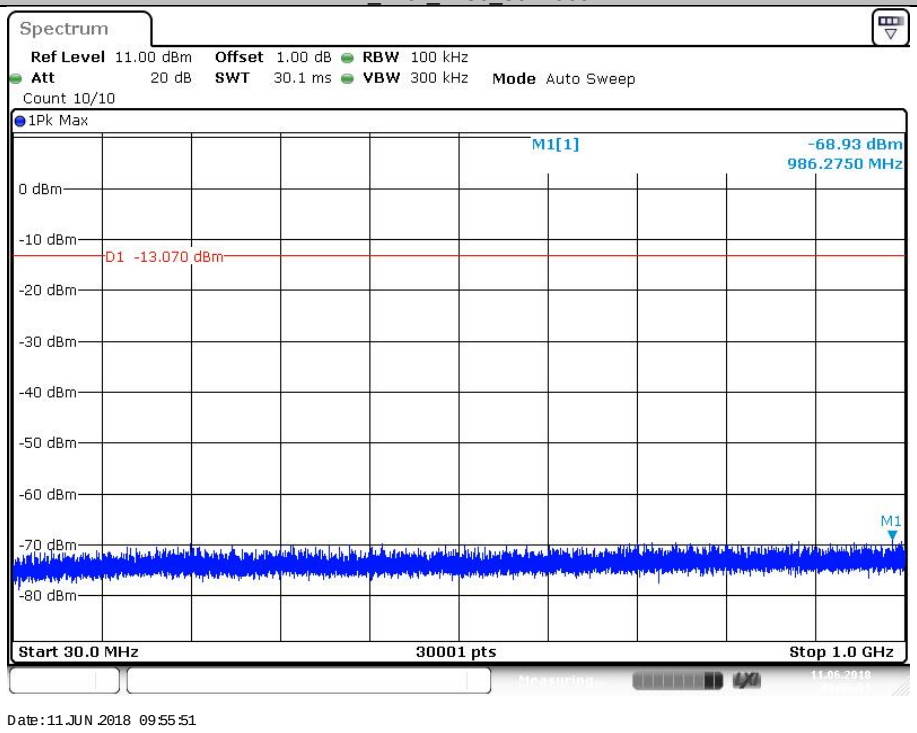


BLE_Ant1_2480_30~1000



BLE_Ant1_2480_1000~26500

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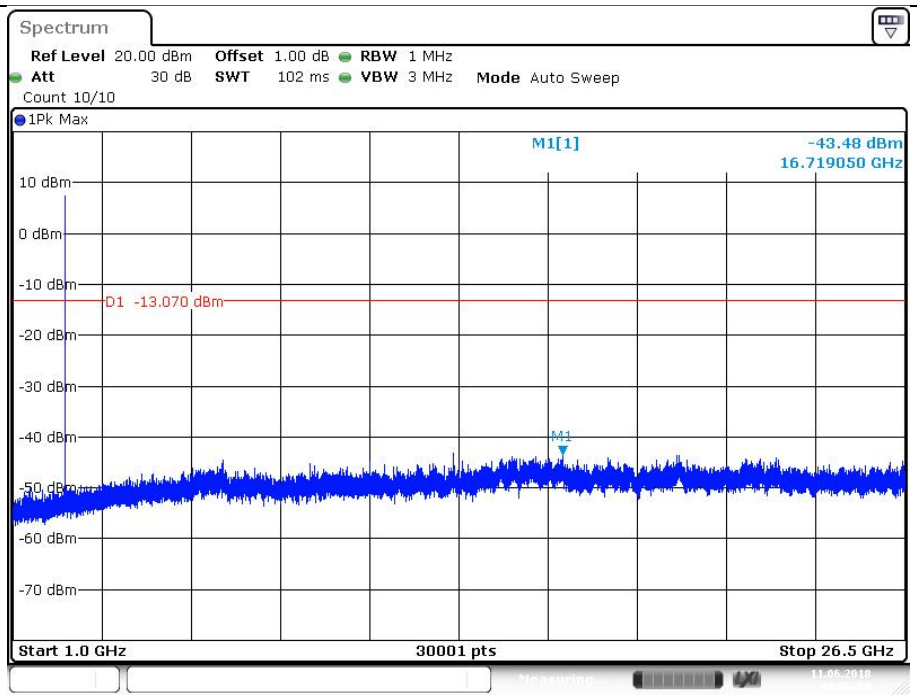

Remark: Test of above 1GHz were performed with 1MHz RBW, we can't find any burst, so they are considered to fulfill the requirement with 100KHz RBW without further testing.

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9.5 Band edge

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW⩾RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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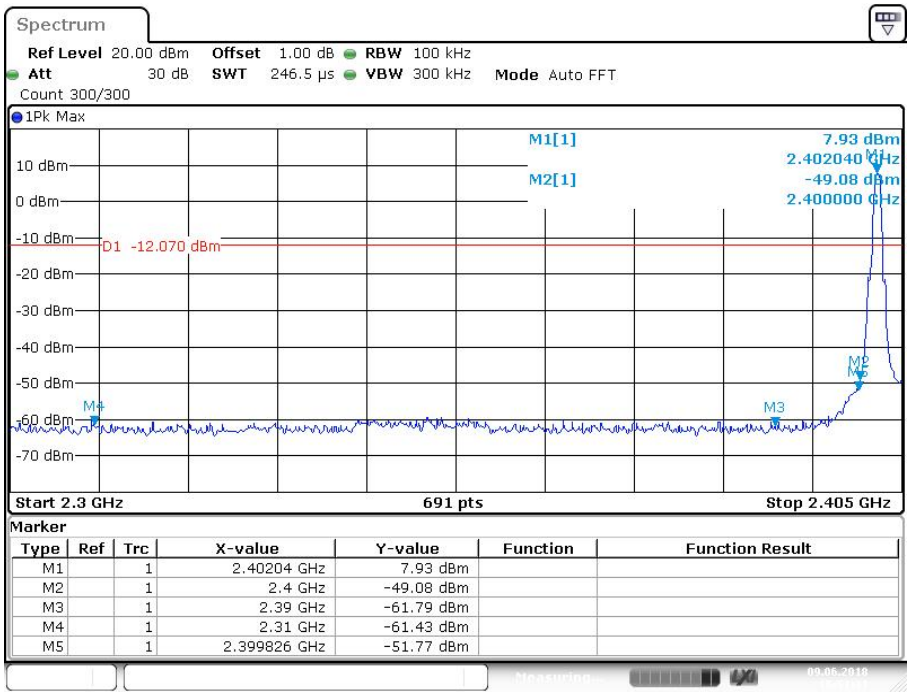
Band edge testing

2402MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40204 GHz	7.93 dBm		
M2		1	2.4 GHz	-49.08 dBm		
M3		1	2.39 GHz	-61.79 dBm		
M4		1	2.31 GHz	-61.43 dBm		
M5		1	2.399826 GHz	-51.77 dBm		

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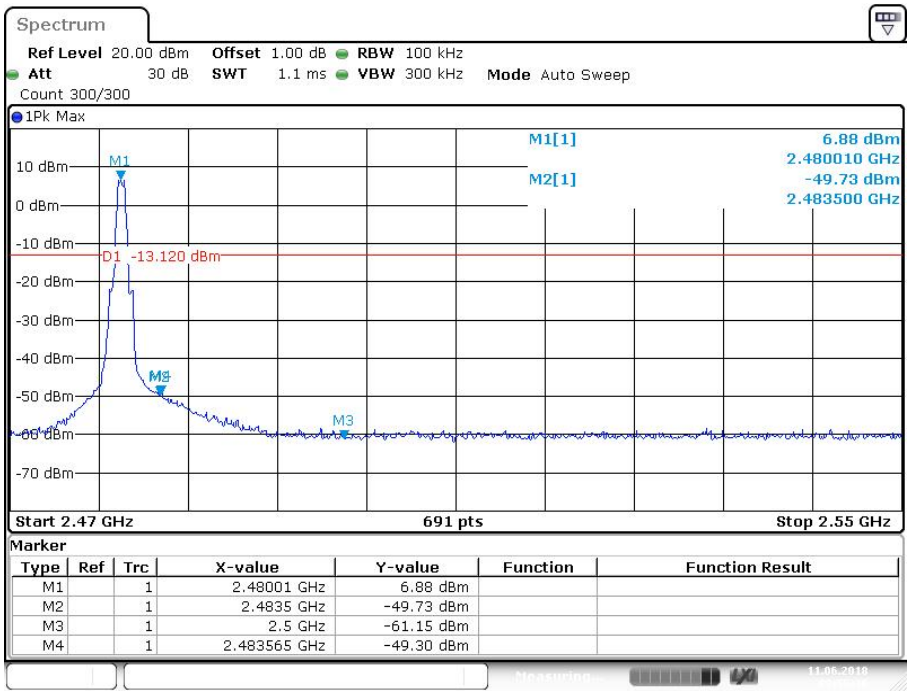
2480MHz



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	6.88 dBm		
M2		1	2.4835 GHz	-49.73 dBm		
M3		1	2.5 GHz	-61.15 dBm		
M4		1	2.483565 GHz	-49.30 dBm		

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9.6 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at requencyabove1GHz

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Spurious radiated emissions for transmitter

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Low channel 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-1000MHz	192.42	27.83	H	43.5	QP	15.67	-30.2	Pass
	295.30	36.21	H	46	QP	9.79	-23.5	Pass
	373.16	33.69	H	46	QP	12.31	-24.0	Pass
	Other Frequency	---	H	---	---	---	---	Pass
	286.46	42.95	V	46	QP	3.05	-22.1	Pass
	382.33	35.05	V	46	QP	10.95	-24.1	Pass
	878.32	25.71	V	46	QP	20.29	-15.7	Pass
	Other Frequency	---	V	---	---	---	---	Pass
1000-25000MHz	*1598.56	33.66	H	74	PK	40.34	-9.7	Pass
	Other Frequency	---	H	74	---	---	---	Pass
	*2247.88	32.43	V	74	PK	41.57	-6.3	Pass
	Other Frequency	---	V	74	---	---	---	Pass

Middle channel 2440MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
1000-25000MHz	*1592.63	37.81	H	74	PK	36.19	-9.7	Pass
	Other Frequency	---	H	74	---	---	---	Pass
	*2244.50	33.68	V	74	PK	40.32	-6.2	Pass
	Other Frequency	---	V	74	---	---	---	Pass

High channel 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
1000-25000MHz	*1599.81	38.33	H	74	PK	35.67	-9.6	Pass
	Other Frequency	--	H	--	--	--	--	Pass
	*1502.56	32.04	V	74	PK	41.96	-10.4	Pass
	Other Frequency	--	V	--	--	--	--	Pass

Remark:

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(1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

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10 Test Equipment List

List of Test Instruments

Radiated Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7
Attenuator	Agilent	8491A	MY39264334	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

TS8997 Test System

Description	Manufacturer	Model no.	Serial no.	cal. due date
Signal Generator	Rohde & Schwarz	SMB100A	108272	2018-7-7
Vector Signal Generator	Rohde & Schwarz	SMBV100A	262825	2018-7-23
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	101251	2019-2-15
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2018-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2018-7-7
Power Splitter	Weinschel	1580	SC319	2018-7-7
10dB Attenuator	Weinschel	56-10	58764	2018-7-14
10dB Attenuator	R&S	DNF	DNF-001	2018-7-14
10dB Attenuator	R&S	DNF	DNF-002	2018-7-14
10dB Attenuator	R&S	DNF	DNF-003	2018-7-14
10dB Attenuator	R&S	DNF	DNF-004	2018-7-14
Test software	Rohde & Schwarz	EMC32	Version 10.38.00	N/A
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.98dB; Vertical: 5.06dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.95dB; Vertical: 4.94dB;
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 2.06dB Frequency test involved: 1.16×10^{-7}

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